

Micromechanical Models for Composite NDE and Diagnostics, Phase II

Completed Technology Project (2009 - 2013)



Project Introduction

Modern aircraft (and next generation spacecraft) increasingly rely on composite components due to their excellent specific strength and stiffness, as well as improvements in costs and manufacturing quality. However, life management for composites is in its infancy compared to life management for metal structures. Limitations in the ability of standard nondestructive evaluation (NDE) methods to observe manufacturing quality and in-service damage evolution of composite structures may prevent designers from realizing their full potential. Current NDE practices are incapable of overcoming these limitations. Thus, a new framework and methodology is needed for high resolution imaging and tracking of manufacturing quality and damage evolution. The goal of this program is to enable assessment of the matrix, fiber, and bonding conditions for composites using a combination of detailed physics-based models, high resolution imaging, and controlled loading sources to isolate the composite characteristic of interest. Micromechanical models allow quantitative determination of composite constituent properties. This program focuses on magnetic field sensing (i.e., eddy-current) methods that can be combined with structural analysis to enhance the diagnostic capabilities of these NDE methods. JENTEK and MR&D are well-positioned to deliver this methodology in the form of commercial software and NDE equipment. We will also work with a major aircraft OEM to maintain our focus on practical solutions to high priority needs.

Anticipated Benefits

Civilian aircraft designers will experience the same benefits in terms of being able to more fully utilize the capability of composite aircraft components to provide weight reductions, payload improvements and fuel efficiency. As composite component design, quality assessment and life management mature, composites will be increasingly integrated into automotive and transportation systems.



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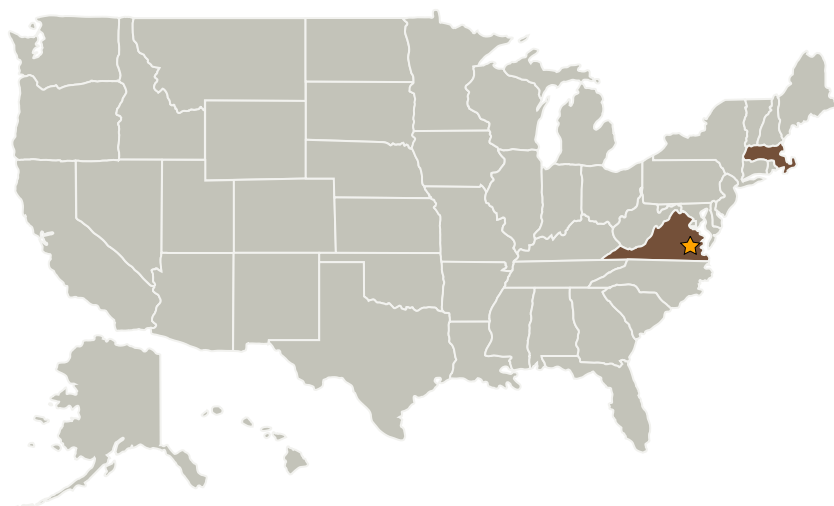
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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Langley Research Center (LaRC)	Lead Organization	NASA Center	Hampton, Virginia
JENTEK Sensors, Inc.	Supporting Organization	Industry	Waltham, Massachusetts

Primary U.S. Work Locations

Massachusetts	Virginia
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Project Transitions

 **December 2009:** Project Start

 **March 2013:** Closed out

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Russell A Wincheski

Principal Investigator:

Andrew Washabaugh

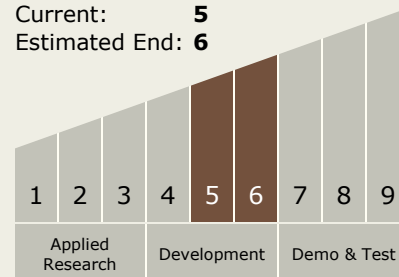
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Technology Maturity (TRL)

Start: **5**
Current: **5**
Estimated End: **6**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.5 Nondestructive Evaluation and Sensors